



## Proactive Approach to Diagnosing and Managing Canine CDS

Creating Collaborative Care Through Nutrition Conversations

# A PANEL DISCUSSION

With dogs living longer lives, cognitive dysfunction syndrome (or CDS, a neurodegenerative condition) is becoming increasingly recognized. Prevalence is reported at approximately 15% overall in the population and markedly increases as dogs get older. In some groups over the age of 15, the prevalence of signs consistent with CDS is as high as 66%. Yet the actual diagnosis of this condition in veterinary practice is no more than 2%.

In this panel discussion moderated by feline internal medicine specialist, Dr. Andy Sparkes, veterinary neurologist and neurosurgeon, Dr. Tom Cardy, and veterinary behaviorist, Dr. Margaret Gruen, explain why canine CDS is underdiagnosed and provide recommendations for diagnosis and management.<sup>1</sup>

## DIAGNOSIS OF CANINE COGNITIVE DYSFUNCTION SYNDROME



**Andrew Sparkes, BVetMed, PhD,  
Dipl. ECVIM, MANZCVS, MRCVS  
(Chair/Moderator)**

### **Dr. Andy Sparkes:** What are typical clinical signs of and how do you diagnose CDS?

**Dr. Margaret Gruen:** The behavioral signs in canine CDS fall into the acronym DISHAA (or DISHAAL):

D = Disorientation.

I = social Interactions.

S = Sleep-wake cycle, which is particularly important for caregivers and for caregiver burden.

H = House soiling in dogs who were previously house trained. It represents a loss of learned behaviors.

A = Activity, i.e., more walking and pacing or an overall decrease in activity.

A = Anxiety. There is debate about whether this is an early or late sign.

(L = Learning/memory deficits.)

There is an assessment questionnaire using DISHAA.<sup>2</sup> Other diagnostic questionnaires have also been developed. In research settings, the Canine Cognitive Dysfunction Rating (CCDR) Scale, the Canine Dementia Scale (CADES), and the Canine Cognitive Assessment Scale (CCAS) are commonly used.

All questionnaires are fairly short. They can be completed by caregivers, although the CADES is meant to be done with a veterinarian present and sometimes helping with interpretation.

The questionnaires provide a score for how the dog is behaving in the different domains. They are most powerful when they are started before signs are present or severe and monitored over time, to look for changes in particular domains. We typically recommend starting when the dog is 8–10 years old and repeating the questionnaire annually.

Without questionnaires, dogs may not be diagnosed until age 13–15. That is why it is so important to use these questionnaires.

### **Comparison of CCDR, CADES, and CCAS scoring questionnaires for assessing CDS:**

Questionnaires	Number of queries	Domains assessed	Comments
CCDR <sup>3</sup>	13	Although not clearly demarcated, 4: spatial orientation, social interactions, activity, house soiling	High classification of "normal"
CADES <sup>4</sup>	17	4: spatial orientation, social interactions, sleep-wake cycle, house soiling	Most sensitive for detecting mild impairment
CCAS <sup>5</sup>	17	6: spatial orientation, social interactions, sleep-wake cycle, house soiling, activity, anxiety	Good correlation with CADES

**Dr. Sparkes:** Do you have a preferred questionnaire?

**Dr. Tom Cardy:** I tend to use the CADES. It classifies dogs into three bands: not impaired, mildly impaired, or severely impaired. I have found that the spread of patients across those three groupings is slightly different to the CCDR and CCAS.

We need to encourage owners to do these questionnaires repeatedly. They are currently underutilized with a much heavier reliance on owner history and clinical signs. If we want to detect subtle trends in cognitive decline and intervene from an earlier age then frequent use and repetition of a single questionnaire is key.

**Dr. Gruen:** While we use different questionnaires for different research projects, from my perspective, you should choose one, become familiar with it, and continue to use it so scores can be tracked over time.



“If we want to detect subtle trends in cognitive decline and intervene from an earlier age then frequent use and repetition of a single questionnaire is key.”  
**Tom Cardy, BSc, BVetMed (Hons), MVetMed, PhD, Dipl. ECVN, MRCVS**

**Dr. Sparkes:** Why are cases often difficult to recognize?

**Dr. Gruen:** One reason is that there are many fairly nonspecific behavioral signs. Canine CDS was often talked about as a diagnosis of exclusion. However, there has been a shift in thought that it is not so much that we need to exclude these other conditions, but that when a dog is 14 or 15 years old, many comorbidities could be present. Thus, we need to understand all of the conditions a patient has and how they contribute to the clinical signs observed. This is important in the diagnosis but does not ever mean that they do not *also* have CDS. We need to understand the contribution that each comorbidity makes into the behaviors that we are seeing, treat other disease, and then see what cognitive signs remain.

One of the top issues that we need to identify and address is chronic pain. There is increasing evidence that pain affects many domains, including cognition. It affects mood and mobility. Sensory dysfunction—being blind or deaf—can also mimic some of the behavioral signs that we see.



“We need to understand all of the conditions a patient has and how they contribute to the clinical signs observed. This is important in the diagnosis but does not ever mean that they do not *also* have CDS.”  
**Margaret E. Gruen, DVM, MVPH, PhD, DACVB**

**Dr. Cardy:** In people, we know that urinary tract infections (UTIs) impact cognition, causing diffuse forebrain signs.

We have a preliminary study that shows uncontrolled UTIs can also cause forebrain signs in dogs and negatively impact cognition. On a more practical level, animals with UTIs are also more prone to incontinence and house soiling.

As a neurologist, people often come to see me because they are concerned that their pet has an intracranial abnormality. However, in many elderly dog cases, I find CDS.

In the neurological exam, I look for other neurological signs that are lateralized to one side of the brain or the other, i.e., affecting the left or the right, because that will always point towards a structural lesion like a cancer or a bleed, rather than CDS.

**Dr. Gruen:** These cases are difficult because many of them can have that bidirectional relationship with CDS and cognitive signs. For example in people, hearing loss is strongly associated with a decline in cognition. Therefore, it is important to evaluate these cases closely, but not think about CDS as only present if we rule out all of these other issues, because they do act together.

**Dr. Sparkes:** Do you use MRI?

**Dr. Cardy:** Typically, I diagnose based on clinical history, questionnaires, clinical exam, and exclusion of concurrent neurological conditions.

It is only in a very small proportion of dogs that we perform MRI. Owners are often reluctant to pursue MRI due to cost. There is often concern about anesthesia in older dogs, particularly if they have a concurrent condition, such as a metabolic or renal condition. Another important consideration is if it will ultimately change our treatment plan and the way we manage these patients.

**Dr. Sparkes:** What are typical findings on MRI?

**Dr. Cardy:** One classic indicator of CDS is cortical atrophy. The cortical layer is gradually thinning and dying off. Accordingly, the axons that come from it are also dying back.

The combined effect is that this leads to ventriculomegaly. The fluid-filled cavities of the brain look much bigger because the brain tissue is shrinking.

Between the hemispheres of the brain is the interthalamic adhesion. Research has shown that various measurements of the interthalamic adhesion alone and in relation to the dimensions of other brain structures can also be a good indicator of CDS.

We also may see cerebral microbleeds, pinprick hemorrhages throughout the brain. We think this is where amyloid deposition, one of the fundamental pathological mechanisms of canine CDS, is leading to vascular damage. There is not much else that causes that: some neoplasms, parasite infections, hypertension. But very often it is an indicator of CDS.

We can also see leukoaraiosis, areas of “whiteness” or hyperintensity on our MRI scans. We think there are two microcirculatory systems which intersect around the ventricles called a junctional zone, where we get arteriolar damage and reduced cerebral blood flow. This results in neurons and axons in this area dying back.

However, since these findings can also be seen in some normal dogs without CDS, the importance of considering the clinical history, questionnaires, and owner perceptions of their pets should not be overlooked.

## MANAGEMENT OF CANINE CDS

### **Dr. Sparkes:** How do you approach management of CDS?

**Dr. Gruen:** This is a chronic, progressive disease, and we are not able to fully reverse any of the clinical signs. However, we try to manage clinical signs and also put in place modalities to try to slow progression.

These are always approached as multimodal cases. We can select from nutritional, pharmaceutical, environmental, exercise, and other therapies.

**Dr. Cardy:** We have protein deposition mainly in the form of amyloid. We may have some tau deposition, but that is still being debated. We also have changes in glucose metabolism, reduced cholinergic function in the brain, low-grade inflammation, mitochondrial dysfunction, decreased neurotransmitter production. Neurons are shutting down.

Since the pathology is so complex, one therapy or intervention will not address all of these patients’ needs.

**Dr. Gruen:** The cases require us to select single or multiple interventions from each of these categories and try to take a holistic approach.

Nutrition is a large component of management.

### **Dr. Sparkes:** How many owners are giving supplements to their dogs? What supplements do you recommend?

**Dr. Cardy:** Over 50% of owners will proactively give their pet supplements once they start to notice behavior changes. In most cases, this is fish oil.

But imagine if we could target those owners through their veterinarians to start giving a combination of supplements that were more targeted at the pathology of CDS.

**Dr. Gruen:** I start with supplementation of the omega-3 fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). Supplementation is recommended for many different conditions. They decrease inflammation overall and are used for joint pain as well.

A lot of the diets designed for older dogs and cats or for joint disease will be supplemented with these fatty acids.

“I start with supplementation of the omega-3 fatty acids docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA).”

**Dr. Gruen**

**Dr. Cardy:** I almost always use medium-chain triglycerides (MCTs). Glucose metabolism of the brain drops off at an alarming rate as humans and pets age, one statistic says potentially by 70%. Therefore, the brain needs alternative energy sources.

MCTs are metabolized by the liver and are broken down into medium-chain fatty acids and ketones, which can act as an alternative energy source. Potentially they have other mechanisms of action such as reducing oxidative stress and enhancing mitochondrial function. They also have an impact in the areas of anxiety and epilepsy.

“I almost always use medium-chain triglycerides (MCTs).”

**Dr. Cardy**

### **Dr. Sparkes:** How can you add MCTs to the diet?

**Dr. Cardy:** Therapeutic diets are available. However, some dogs do not find those palatable, or they might be on a different diet, for example a therapeutic renal diet.

In those cases, you can supplement the diet with MCT oil. Look for MCT oils rich in C8 and C10 MCTs. It depends on which studies you look at, but normally you need to add about 6–9% of their metabolic energy requirement as MCTs.

Research has evaluated different MCT concentrations and their effectiveness. There is not much gain in using higher proportions of MCTs, and we very often find that palatability decreases. It is about finding that balance.

**Dr. Gruen:** Many other supplements fall into the general antioxidant category. They are available in different combinations, products, and diets.

But I agree, being able to have informed conversations with people so that we can target what they are giving, rather than just having them reach for what their friends say is good, is really helpful. Having these conversations on the earlier side before they are really seeing clinical signs can help us prolong that early period before the behaviors become severe.

### **Dr. Sparkes:** What medications would you consider for a dog with CDS?

**Dr. Cardy:** Options include selegiline, a monoamine oxidase inhibitor with some neuroprotective function, and propentofylline, which can potentially increase cerebral blood flow.

I tend to use fluoxetine to treat anxiety. In preclinical studies, fluoxetine was also shown to have an impact on cognition. The link between anxiety and CDS is well documented in humans and animal models.

**Dr. Gruen:** We are often selecting from either a medication that is approved for CDS or trying to manage the anxiety. We use daily or sometimes targeted anti-anxiety medications. Fluoxetine has to be given daily for weeks to be effective.

Then we may use short-acting targeted medications, such as at night to assist with sleep or for visits to the veterinary clinic. For example, administering melatonin or gabapentin at night may help with sleep.

**Dr. Cardy:** I always address pain, and managing degenerative joint disease and mobility is a priority. By giving a nonsteroidal or joint protection, gabapentin, paracetamol for flare ups, the change in these dogs is incredible.

### **Dr. Sparkes:** What are the other components of management?

**Dr. Gruen:** I focus on the environment, enrichment, and exercise, which are similarly recommended for people with mild cognitive impairment.

For dogs, we need to ensure they are getting social interactions, that interactions are positive, and we are providing mental stimulation. Whether that encompasses food puzzles or training games, even going out for sniff walks—games and activities that allow them to use their senses and keep their brains active.

Then pairing that with exercise, which can be so helpful for both pain and cognition. Research has shown that activity and exercise decrease with age and this can be linked to more isolation and worse cognitive functioning.

So setting up times for walks and play for dogs with CDS and making those as predictable as possible can aid in management. The more the dogs feel control in their environment, the less anxious they seem. Managing the anxiety component is essential.

For many dogs we put in place routines and predictable signs for when things are going to happen. Especially if there is sensory loss, we manage keeping the environment as similar as possible so that patients are not stressed.

Resetting the sleep-wake cycle in a pet with altered sleep habits can make a huge difference for cognition, quality of life, and caregiver burden, which is something we do not consider enough for the owners of these dogs.

### **Dr. Sparkes:** What is the impact of comorbidities on our ability to manage CDS? How do we manage the priorities?

**Dr. Gruen:** Managing these cases requires us to consider all of the conditions we are trying to treat and manage and what we can do for each of them. Certain conditions may be more pressing for a given patient.

But for cognitive dysfunction we can also make environmental changes. We have the mental and physical engagement. Despite comorbidities, we can nearly always add those things in, and those are always good for quality of life.

As veterinarians, we have a real opportunity with these dogs to think about geriatric medicine more broadly.

### **Dr. Sparkes:** Are there links between the gut microbiome and cognition as well as anxiety?

**Dr. Cardy:** We know in human medicine, the microbiome has links to Parkinson's disease, Alzheimer's disease, depression, dementia, etc.

Evidence is emerging that there are similar links in dogs and cats.

**Dr. Gruen:** A *Bifidobacterium longum* probiotic that helps decrease anxiety can be helpful in some of these patients.

Looking at anxiety as part of the suite of signs we see with CDS is one example where a lot of evidence is building on the link between the gut microbiome and anxiety.

## CATS AND COGNITIVE DYSFUNCTION

### **Dr. Sparkes:** Are cats affected with cognitive dysfunction?

**Dr. Gruen:** Yes. Some of their neuropathology is slightly different to dogs. For instance, they seem to have more tau pathology and more diffuse disease. But they are very similar in their presentations with the exception that vocalization at night seems to be one of their primary signs, so it has been suggested that the acronym for their clinical signs reflects this, i.e., VISHDAA (VISHDAA<sup>6</sup>):

V = Vocalization.

I = social Interactions.

S = Sleep-wake cycle.

H = House-soiling, i.e., inappropriate elimination.

D = Disorientation.

A = Activity.

A = Anxiety.

(L = Learning/memory deficits.)

It is the same idea as DISHAA, but the mild/moderate/severe groupings have not been well established in cats.

We manage cats similarly but should remember that giving medications to cats can be difficult, and we should ensure that we are preserving the cat caregiver relationship with our treatment recommendation. We should think carefully about how we train people to make sure that medications/supplements are easy for them to give.

MCTs in cats are often less palatable. If you try to reach percentages where we think there will be a real cognitive benefit, cats are not eating them. Therefore in cats, we use the omega-3 fatty acids and antioxidant supplements.

## CLIENT COMMUNICATION

**Dr. Sparkes:** This is clearly a complex disease. Communication with owners must be key to be able to manage and improve the quality of life for these dogs, correct?

**Dr. Cardy:** We need to be proactive, engaging owners, making sure they are aware of the clinical signs of CDS. For a dog with CDS presenting at 8 rather than 12 years old, we have more options in terms of optimizing mobility, environment, and nutrition to try and maximize quality of life.

**Dr. Gruen:** For many conditions without a cure, I think we are hesitant sometimes to mention them. But if we do not start the conversation, there is the tendency for people to think, this is just what happens when pets get old. However, if we ask about aging changes when dogs are 8–10 years old, we have an opportunity to lengthen that early period and slow CDS progression to extend the pet's health span.

Then, we should talk with owners about the partnership that we are embarking on to improve their dog's quality of life and their own. We want to make sure we are managing owner expectations. We may have to do various workups to ensure we have accounted for comorbidities and try many different modalities. The first medication that we use may not work. In humans, the first medication that is used in behavior only works about 30% of the time.

It can be a long process to find what works. Since CDS is a chronic, progressive disease, what helps now may not always help. Owners should know they can contact their veterinarians as needed so that adjustments to management can be made.

## CHAIR/MODERATOR

**Andrew Sparkes, BVetMed, PhD, Dipl. ECVIM, MANZCVS, MRCVS** is an independent consultant. Previously, he served as Veterinary Director of International Cat Care and the International Society of Feline Medicine (ISFM). Dr. Sparkes has published widely and is the founding and current co-editor of the *Journal of Feline Medicine and Surgery*.

## PANELISTS

**Tom Cardy, BSc, BVetMed (Hons), MVetMed, PhD, Dipl. ECVN, MRCVS** completed his specialist training at the Royal Veterinary College (RVC) where he helped establish a brain and tissue bank to advance research into neurological diseases. He spent two years as a lecturer in neurology and neurosurgery at the RVC before moving to private practice. Areas of interest include lifelong management of canine epilepsy and use of 3D printed guides and implants in complex spinal surgeries.

**Margaret E. Gruen, DVM, MVPH, PhD, DACVB** completed a PhD in Comparative Biomedical Sciences at NC State University and post-doctoral studies at Duke University, served as co-Director of the Duke Canine Cognition Center, and co-founded the Duke Puppy Kindergarten. She has an active research collaboration studying cognitive and emotional development in puppies. She is currently an Associate Professor of Behavioral Medicine and co-Director of the Feline Health Center at NC State University.



## FOOTNOTES

<sup>1</sup> Adapted from the live broadcast of A Proactive Approach to Diagnosing and Managing Canine Cognitive Dysfunction, a Purina Institute Creating Collaborative Care Through Nutrition Conversations webinar, which is available on demand at [Proactive Approach to Diagnosing and Managing Canine CDS](#).

<sup>2</sup> See next two pages. A version that can be downloaded or emailed is available by searching “DISHAA Assessment Tool” at [purinainstitute.com/centresquare](http://purinainstitute.com/centresquare).

<sup>3</sup> Salvin, H. E., McGreevy, P. D., Sachdev, P. S., & Valenzuela, M. J. (2011). The canine cognitive dysfunction rating scale (CCDR): A data-driven and ecologically relevant assessment tool. *The Veterinary Journal*, 188(3), 331-336. doi: 10.1016/j.tvjl.2010.05.014

<sup>4</sup> Madari, A., Farbakova, J., Katina, S., et al. (2015). Assessment of severity and progression of canine cognitive dysfunction syndrome using the CANine DEmentia Scale (CADES). *Applied Animal Behaviour Science*, 171, 138-145. doi: 10.1016/j.applanim.2015.08.034

<sup>5</sup> Le Brech, S., Amat, M., Temple, D., & Manteca, X. (2022). Evaluation of two practical tools to assess cognitive impairment in aged dogs. *Animals*, 12, 3538. doi: 10.3390/ani12233538

<sup>6</sup> Sordo, L., & Gunn-Moore, D. A. (2021). Cognitive dysfunction in cats: Update on neuropathological and behavioural changes plus clinical management. *Veterinary Record*, 188(1), e3. doi: 10.1002/vetr3



Cognitive Dysfunction Syndrome (CDS) is an irreversible degeneration of the brain similar to Alzheimer’s disease in humans, characterized by progressive cognitive impairment beyond that expected to occur with aging. CDS has a slow onset, can be difficult to manage and affects an estimated 14% of dogs 8 years and older.

- D** DISORIENTATION
- I** SOCIAL INTERACTIONS
- S** SLEEP/WAKE CYCLES
- H** HOUSESOILING, LEARNING AND MEMORY
- A** ACTIVITY
- A** ANXIETY

### What is DISHAA?

DISHAA is a tool to help you and your veterinarian assess the mental acuity of your dog, and for your veterinarian to potentially diagnose Cognitive Dysfunction Syndrome (CDS).

Date: \_\_\_\_\_

Owner’s name: \_\_\_\_\_ Pet’s name: \_\_\_\_\_

Age: \_\_\_\_\_ Gender:  Male  Female Neutered/Spayed:  No  Yes

Breed: \_\_\_\_\_ Weight: \_\_\_\_\_

BCS (Body Condition Score 1-9): \_\_\_\_\_ Current Diet: \_\_\_\_\_

Medications and Dosage Frequency: \_\_\_\_\_

**Please complete this canine senior pet cognitive assessment. If you’ve noticed changes in multiple behavioral categories, be sure to talk to your veterinarian today about the health of your pet’s aging brain.**

#### BEHAVIORAL SIGNS

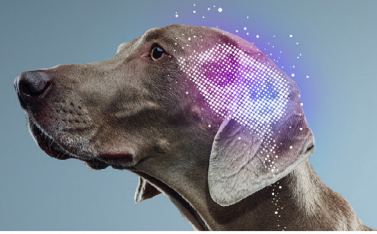
Identify signs that have arisen or progressed since 8 years of age and older.

**Score as 0=none, 1=mild, 2=moderate, 3=severe**

**Score**

DISORIENTATION	
Gets stuck, difficulty getting around objects, goes to hinge side of door	
Stares blankly at walls, floor, or into space	
Does not recognize familiar people/familiar pets	
Gets lost in home or yard	
Less reactive to visual (sights) or auditory (sounds) stimuli	

**Please complete assessment on other side.**



**BEHAVIORAL SIGNS**

Identify signs that have arisen or progressed since 8 years of age and older.

**Score as 0=none, 1=mild, 2=moderate, 3=severe**

**Score**

**SOCIAL INTERACTIONS**

More irritable/fearful/aggressive with visitors, family or other animals

Decreased interest in approaching, greeting or affection/petting

**SLEEP/WAKE CYCLES**

Pacing/restless/sleeps less/waking at night

Vocalization at night

**HOUSESOILING, LEARNING AND MEMORY**

Less able to learn new tasks or respond to previously learned commands/name/work

Indoor soiling of urine \_\_\_ or stool \_\_\_ /decreased signaling to go out

Difficulty getting dog's attention/increased distraction/decreased focus

**ACTIVITY**

Decrease in exploration or play with toys, family members, other pets

Increased activity including aimless pacing or wandering

Repetitive behaviors, e.g., circling \_\_\_ chewing \_\_\_ licking \_\_\_ stargazing \_\_\_

**ANXIETY**

Increased anxiety when separated from owners

More reactive/fearful to visual (sights) or auditory (sounds) stimuli

Increased fear of places/locations (e.g., new environments/going outdoors)

**TOTAL (BE SURE TO CARRY OVER THE SCORES FROM FRONT SIDE OF SHEET)**

Once this form is completed, your veterinarian will determine the cause of these signs through a physical examination and recommended diagnostic tests. However, even if your senior pet is experiencing multiple health issues associated with aging, there may be some degree of CDS.

A score of 4-15 is consistent with mild, 16-33 is moderate, and >33 is severe CDS.

Assessment was created by: Dr. Gary Landsberg, DVM, DACVB, DECAWBM, Vice President, Veterinary Affairs CanCog Technologies; to aid in diagnosing Canine Cognitive Dysfunction Syndrome. Purina trademarks are owned by Société des Produits Nestlé S.A. Printed in USA. VET0938A-0517

## GET TO KNOW THE PURINA INSTITUTE

### Advancing Science for Pet Health

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